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# EXPERIMENTS WITH LIGHT TRAPS FOR CONTROL OF THE PINK BOLLWORM

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Early work with light traps indicated that pink bollworm moths (Pectinophora gossypiella (Saund.)) are not strongly attracted to incandescent lamps. With the development of new sources of ultraviolet radiation in the last few years, it was thought that they might be attracted to one or more of these new-type lamps. Work conducted by Glick and Hollingsworth[2/] indicated that these moths are attracted to a source of light that has a peak radiation in the near-ultraviolet region of the spectrum. Light sources that emit such radiation include mercury-vapor lamps, black-light fluorescent lamps, and black-light fluorescent lamps with integral black-light filters.

In order to evaluate the use of the black-light fluorescent lamps in new types of traps as a means of controlling pink bollworm infestations in the field, eight commercial traps were installed in cotton fields in Cameron County, Tex., in 1953. Two types of traps, four of each type, were used. To find out at what distance the moths might be attracted by the lamps, the traps were installed in separate fields.

## Equipment and Methods

The backboard trap (fig. 1) consisted of a vertical metal backboard approximately 38 inches long and 24 inches high mounted above a metal funnel. The funnel opening was approximately 38 inches long and 20 inches wide at the top and 6 inches wide at the bottom. Staggered baffles inside the funnel prevented the insects from working their way back up through the trap. The light was supplied by two 30-watt black-light fluorescent lamps mounted horizontally at the top of the funnel, one on each side of the backboard.

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1/ Conducted in cooperation with the Texas Agricultural Experiment Station.

2/ Glick, Perry A., and Joe P. Hollingsworth. 1954. Response of the pink bollworm moth to certain ultraviolet and visible radiation. Jour. Econ. Ent. 47: 81-86.

The suction trap (fig. 2) consisted of a vertical 4-vane metal baffle approximately 20 inches high and 24 inches wide mounted above a metal cylinder 24 inches in diameter and 18 inches high. Mounted within the cylinder was a motor-driven 6-blade fan, which sucked air down around the baffle and discharged it at the bottom of the cylinder. The light was furnished by four 15-watt black-light fluorescent lamps mounted vertically in the 4-vane baffle assembly.

The backboard traps were mounted on poles and the suction traps on metal legs so that the lamps were approximately 6 to 8 feet above the ground.

The backboards of each type of trap were coated with a green fluorescent pigment. A plastic mesh bag was attached to the bottom of each trap to collect the insects. Electrically operated clocks were set to turn the lights on at 6 p.m. and off at 6 a.m. The suction traps were operated until about 10 a.m. to allow the operator time to pick up the collections before the fans cut off.

The bags on the traps were changed every morning except Saturday and Sunday. The bags containing the previous night's collections were brought into the laboratory and fumigated. The insects were then sifted through a 1/4-inch mesh screen. Samples of the small insects were weighed out, and the pink bollworm moths were counted. The total number of pink bollworm moths in the collection was calculated on the basis of the total weight of the material that passed through the screen.

Green-boll infestation records were made at selected points in each field by taking a 25-boll sample within 8 to 10 feet of each point. The sample points were selected on lines radiating in different directions from the trap, the number of points on each line and the number of lines depending on the size and shape of the field. The boll samples were brought into the laboratory and inspected for mines made by pink bollworms. Samples were taken every 2 weeks as long as there were sufficient green bolls in the field.

## Trap Locations and Results

All traps were installed in the Bayview area at first. Traps Nos. 1 to 4 were installed on April 3, and Nos. 5 to 8 on May 20. Nos. 1, 3, and 4 were later moved to new locations. All traps were removed from the fields about September 1. The numbers caught in each trap are summarized in table 1, and a monthly summary of the sex determinations is shown in table 2. The green-boll infestation records are summarized in table 3.

Trap No. 1, a backboard trap, was installed on the south edge of a small field in which the cotton was just coming up. Owing to the extreme draught, most of the plants failed to survive the seedling stage. No infestation records were made in this field. A total of 27 pink bollworm moths

were collected up to the first of July, when the trap was moved to an irrigated field of approximately 10 acres south of Russelltown. The trap was placed on the north edge of the field. This field was well advanced in maturity and had a heavy infestation of pink bollworms. About half the field was plowed up on July 24, and the remainder on August 10. From the first of July to the last of August a total of 2,653 pink bollworm moths were caught, nearly 80 percent of them after the field had been plowed up in August. Green-boll infestation records made on July 15 and 29 showed the average infestation for the entire field to be more than 95 percent on each date.

Trap No. 2, a suction trap, was installed on the north edge of an early field of approximately 37 acres. The cotton was in the 8- to 10-leaf stage; on July 10 it was plowed up. Nearly half the pink bollworm moths caught in this trap were taken during the last 3 weeks of June, and only 6 before the first of June. Green-boll infestation records showed that the infestation for the field as a whole increased considerably between June 15 and 30. The area within 150 feet of the trap showed a much higher infestation than the remainder of the field. There was little difference in infestation between the intermediate points and those more than 400 feet away.

Trap No. 3, a suction trap, was installed on the south edge of a 10-acre field. The cotton was just coming up in the 5 acres nearest the trap, but that in the remaining 5 acres was a little further advanced. Because of lack of moisture, little of the cotton in the first 5-acre block survived the seedling stage. A total of 269 pink bollworm moths were caught up to June 30. On July 1 this trap was moved to an irrigated field of approximately 18 acres in the San Benito area. The cotton plants in this field were well developed and fruiting well at this time. The trap was placed at the southwest corner of the field. In line with trap No. 3 and only a few feet away were a mercury-vapor light trap and three black-light traps of varying designs. These traps had been in this field throughout the season. During July and August trap No. 3 caught 83,980 moths, 85 percent of them in August. The mercury-vapor and three black-light traps and a trap equipped with three 2-watt argon lamps, which was operated in this field for five nights in August, caught a total of 91,034 moths from January 1 to September 1. Green-boll infestation records showed an increase from 50 percent on July 6 to 94 percent on August 3. The seasonal average infestation within 100 feet of the trap was 10 percent greater than that between 100 and 200 feet, and 12 percent greater than that more than 200 feet away.

Trap No. 4, a backboard trap, was installed on the west side of a nonirrigated 10-acre field. The cotton was in the seedling stage. The plants were scattered and did not produce much fruit. The percentage of infested green bolls more than doubled between June 17 and 30. The seasonal average infestation was a little higher within 100 feet of the

trap than in the area 100 to 200 feet away, and slightly lower than at the points more than 200 feet away. This trap had caught only one pink bollworm moth by July 6, when it was moved to a late, irrigated 17-acre field in the San Benito area. The trap was placed at the northeast corner of the field. The cotton plants were already fruiting well. During July and August 269 pink bollworm moths were caught at this location. When the trap was installed, the green-boll infestation averaged 43 percent; by August 3 it was 95 percent. The seasonal average infestation within 100 feet of the trap was slightly lower than that between 100 and 200 feet, but was the same as that more than 200 feet away.

Trap No. 5, a suction trap, was installed near the northwest corner of an unirrigated field of approximately 80 acres. A few feet from this trap were a mercury-vapor light trap and a black-light trap that had been there since the previous year. The cotton was already fruiting. There was a uniform stand of plants with good potential productiveness, but because of the draught the growth was stunted and the fruiting period was greatly shortened. The cotton was plowed up on July 30 and 31. Most of the pink bollworm moths taken in trap No. 5 were caught in July and August after the majority of the cotton bolls had matured. The mercury-vapor and black-light traps caught a total of only 267 pink bollworm moths in this field from January 1 to September 1. The cotton did not fruit over a long enough period to allow the infestation to build up very high, but it more than doubled in the 2-week period between records. The seasonal average infestation within 150 feet of the trap was a little higher than in the remainder of the field.

Trap No. 6, a backboard trap, was installed on the western edge of a 7-acre unirrigated field. The cotton was already fruiting. Immediately in back of the trap was another field of about the same size in which the stand was thin. The stalks on these fields were cut on August 6. Although the green-boll infestation more than doubled between June 15 and July 1, only 41 pink bollworm moths were caught in the trap from the time of installation until the last of August. The seasonal average infestation within 100 feet of the trap was only slightly less than it was in the rest of the field.

Trap No. 7, a suction trap, was installed on the east side of a late field of approximately 21 acres. This field received one early application of water, and made a fair amount of growth and fruited over a relatively long period of time. The plants were squaring at the time the trap was installed. The stalks were cut on August 11. This field was also used for an insecticide experiment. A strip through the middle approximately 130 feet wide and containing approximately 2.5 acres was left unpoisoned as a check. The light trap was located at the east end of this area. The rest of the field was sprayed with DDT seven times between June 10 and July 21. More than one-third of the pink

bollworm moths caught in this trap were taken during the last week in July, and less than a third in August. The infestation of green bolls averaged 19 percent on June 23, and by August 4 it had increased to 78 percent. The seasonal average infestation within 100 feet of the trap was 14 percent greater than 100 to 200 feet away, and 18 percent greater than that more than 200 feet away. When the poisoned and unpoisoned areas were compared, the unpoisoned area averaged 25 percent more infested bolls than the poisoned area (table 4).

Trap No. 8, a backboard trap, was installed on the south side of a 60-acre unirrigated field. The cotton was already fruiting, but owing to the drought the plants were stunted and the fruiting period was greatly shortened. The field was plowed up on July 23. Only 15 pink bollworm moths were caught in this trap during the entire season. There were only enough bolls in this field to make one infestation record, on June 20, when 13 percent of the bolls were found to be infested.

The percentage of female moths in the trap collections varied from a high of 43 percent in trap No. 6 to a low of 15 percent in trap No. 5. For all traps the number of female moths represented only 26 percent of the total catch.

On the basis of the experiments reported, the use of these traps and lamps as a means of controlling pink bollworm infestation is not warranted.

## Summary

Two types of light traps were tested in cotton fields in Cameron County, Tex., during 1953 in order to evaluate them as a possible means of controlling the pink bollworm (Pectinophora gossypiella Saund.). Despite the presence of the light traps adjacent to the cotton fields, the infestation of pink bollworms increased in each of these fields throughout the period the cotton was fruiting. Where suction traps were used the seasonal average infestation was higher in the vicinity of the trap than in the rest of the field, a possible indication that these traps were drawing the moths in from the distant parts of the fields. In the fields in which backboard traps were used the distance from the trap made little difference in the infestation. Few moths were caught until either the infestation had built up to serious proportions or the cotton had matured. All but one of the suction traps caught more moths than the backboard traps. In no case did the number caught represent more than a small percentage of the number estimated to be present in the field. The males outnumbered the females by nearly a 3-to-1 ratio. The use of these traps for controlling the pink bollworm does not seem warranted from these tests.

Table 1.--Summary by weeks of number of pink bollworm moths collected in light traps during 1953

| Week ending | | No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 |
|---|---|---|---|---|---|---|---|---|---|
| April | 10 | 17 | 3 | 52 | 0 | -- | -- | -- | -- |
| | 17 | 0 | 0 | 1 | 0 | -- | -- | -- | -- |
| | 24 | 0 | 1 | 8 | 0 | -- | -- | -- | -- |
| May | 1 | 0 | 0 | 2 | 0 | -- | -- | -- | -- |
| | 8 | 0 | 0 | 17 | 0 | -- | -- | -- | -- |
| | 15 | 0 | 0 | 9 | 0 | -- | -- | -- | -- |
| | 22 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 29 | 0 | 2 | 1 | 0 | 0 | 2 | 0 | 0 |
| June | 5 | 0 | 5 | 0 | 0 | 1 | 0 | 1 | 0 |
| | 12 | 7 | 33 | 49 | 0 | 5 | 0 | 3 | 0 |
| | 19 | 1 | 295 | 110 [1/] | 1 | 176 | 5 | 15 | 0 |
| | 26 | 2 [1/] | 221 | 18 [1/] | 0 | 201 | 6 | 303 | 4 |
| July | 3 | 62 | 187 | 94 | 0 [1/] | 104 | 18 | 282 | 8 |
| | 10 | 96 | 69 | 282 | 13 | 126 | 0 | 45 | 0 |
| | 17 | 13 | 151 | 914 | 64 | 404 | 3 | 300 | 0 |
| | 24 | 27 | 8 | 1,347 | 22 | 64 | 4 | 252 | 0 |
| | 31 | 62 | 20 | 9,724 | 58 | 162 | 0 | 1,488 | 0 |
| August | 7 | 109 | 14 | 21,024 | 36 | 34 | 3 | 376 | 1 |
| | 14 | 1,633 | 132 | 35,852 | 71 | 211 | 0 | 612 | 2 |
| | 21 | 626 | 193 | 10,610 | 0 | 154 | 0 | 122 | 0 |
| | 28 | 25 | 0 | 4,133 | 5 | 0 | 0 | 0 | 0 |
| | Total | 2,680 | 1,334 | 84,249 | 270 | 1,642 | 41 | 3,799 | 15 |

1/ Trap was moved after this date.

Table 2.--Sex ratio of pink bollworm moths collected in light traps

| Trap No. | Month | Number of moths examined | Number of females |
|---|---|---|---|
| 1 | June | 6 | 1 |
| | July | 77 | 24 |
| | August | 88 | 17 |
| | Total | 171 | 42 |
| 2 | April-May | 3 | 0 |
| | June | 188 | 46 |
| | July | 60 | 5 |
| | August | 26 | 4 |
| | Total | 277 | 55 |
| 3 | April | 10 | 5 |
| | May | 29 | 24 |
| | June | 15 | 5 |
| | July | 1,231 | 343 |
| | August | 2,192 | 538 |
| | Total | 3,477 | 915 |
| 4 | June | 1 | 0 |
| | July | 73 | 21 |
| | August | 25 | 14 |
| | Total | 109 | 35 |
| 5 | June | 81 | 12 |
| | July | 123 | 19 |
| | August | 62 | 8 |
| | Total | 266 | 39 |
| 6 | May | 2 | 1 |
| | June | 4 | 3 |
| | July | 12 | 2 |
| | August | 3 | 3 |
| | Total | 21 | 9 |
| 7 | June | 64 | 25 |
| | July | 143 | 32 |
| | August | 103 | 49 |
| | Total | 310 | 106 |
| 8 | Season | 5 | 3 |
| | Grand total | 4,636 | 1,204 |

Table 3.--Percent of bolls infested with pink bollworms at different distances from light traps. All in fields at Bayview unless otherwise indicated.

| Trap No. and date | Up to 100 feet | 100 to 200 feet | Over 200 feet |
|---|---|---|---|
| 3 (San Benito) | 10 points | 10 points | 13 points |
| July 6 | 64 | 47 | 42 |
| 20 | 74 | 66 | 62 |
| August 3 | 95 | 92 | 94 |
| Average | 78 | 68 | 66 |
| 4 | 8 points | 8 points | 7 points |
| June 17 | 13 | 21 | 19 |
| 30 | 52 | 38 | 48 |
| Average | 33 | 29 | 34 |
| 4 (San Benito) | 6 points | 6 points | 10 points |
| July 6 | 39 | 49 | 42 |
| 20 | 89 | 87 | 82 |
| August 3 | 93 | 94 | 97 |
| Average | 74 | 77 | 74 |
| 6 | 11 points | 11 points | 10 points |
| June 15 | 25 | 20 | 17 |
| July 1 | 39 | 47 | 48 |
| Average | 32 | 34 | 33 |
| 7 | 12 points | 12 points | 16 points |
| June 23 | 25 | 18 | 16 |
| July 7 | 62 | 46 | 40 |
| 21 | 67 | 45 | 47 |
| August 4 | 91 | 79 | 67 |
| Average | 61 | 47 | 43 |
| | Up to 150 feet | 150 to 400 feet | Over 400 feet |
| 2 | 11 points | 11 points | 12 points |
| June 15 | 58 | 38 | 30 |
| 30 | 75 | 56 | 56 |
| Average | 66 | 45 | 42 |
| 5 | 15 points | 15 points | 15 points |
| June 22 | 15 | 12 | 14 |
| July 7 | 43 | 37 | 31 |
| Average | 29 | 25 | 23 |

Table 4.--Percent of bolls infested in poisoned and unpoisoned areas in the field on which trap No. 7 was installed

| Date | Unpoisoned area (10 points) | Poisoned area (30 points) |
|---|---|---|
| June 23 | 23 | 18 |
| July 7 | 74 | 40 |
| 21 | 77 | 44 |
| August 4 | 96 | 72 |
| Average | 68 | 43 |

Figure 1.--Backboard type of light trap with two 30-watt black-light fluorescent tubes.

Figure 2.--Suction type of light trap with four 15-watt black-light fluorescent tubes.